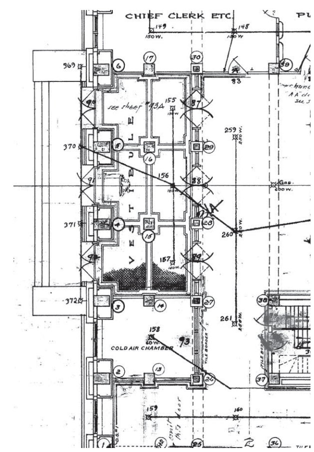
1. BRIEF HISTORY OF MECHANICAL SYSTEMS

ORIGINAL (1916) CENTRAL HEAT PLANT

a. The original building had a steam heating system, a natural ventilation system and no air conditioning. The heat source was a steam boiler plant The original central heat plant building is still being used today. It is located northwest of the State Office Building. The boilers, pumps, and deaerator were replaced in about 1964. A pipe tunnel originally ran from the central heat plant to the central north side of the Capitol. This tunnel was replaced in about 1964. The new tunnel is located west of the Plaza and connects into the west end on the north side of the Capitol.

ORIGINAL (1916) HVAC SYSTEMS

b. The original heating system in the Capitol consisted primarily of cast iron steam radiators. Ventilation was provided by operable windows, perimeter vertical shafts and interior vertical shafts. The perimeter vertical shafts occur on each side of each column at the building perimeter. The shafts are approximately 30" x 12". The shafts run from the Ground Floor to the Attic. Grilles were provided at the perimeter rooms. The Attic space was provided with gravity ventilators. Several "Cold Air Chambers" were located in the Basement and ducted to various interior shafts. The cold air chambers were rooms about 150 square feet located on the exterior walls. The cold air chambers draw outside air into the building for natural ventilation. The interior shafts served such areas as the House Chambers, Senate Chambers and the Supreme Court.



1960 HVAC SYSTEM

c . A new heating, ventilating and air conditioning system was installed in the Capitol in the 1960's. The steam radiators were removed. The natural ventilation systems of cold chambers were sealed up. The ducts from the cold air chambers to the interior shafts were also removed.

2. CURRENT MECHANICAL SYSTEMS

CURRENT HEAT PLANT

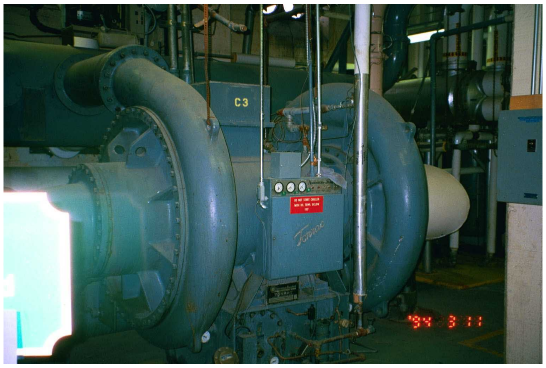
a. The heat source is two high pressure steam gas/oil fired boilers located in the central heat plant. Natural gas is the primary fuel with oil as a standby fuel. The boilers were manufactured in 1964. The heat plant includes a deaerator, condensate pumps and boiler feed pumps. This equipment was installed in about 1964. There is a 20,000 gallon buried oil storage tank, installed in about 1964. Steam and condensate are piped through a tunnel to the Capitol. The steam pipe is 8"; the condensate return pipe is 5". The heat plant also serves the State Office Building, Cafeteria and the D.U.P. Museum. Each boiler has a capacity of 20,000 pounds per hour of steam. One boiler can handle the heating load down to 0°F outside. Below 0°F, both boilers need to run.

CURRENT COOLING SOURCE

b. The cooling source is two chillers located in the Basement of the State Office Building and one standby chiller located in the Basement of the Capitol. The chillers in the State Office Building are water cooled centrifugal chillers. Each chiller capacity is 350 tons. The chillers are served by a single cooling tower located on the roof of the State Office Building. The chillers are currently piped such that one serves the Capitol and one serves the State Office Building. The chiller in the Capitol is for standby use only. It is a water cooled centrifugal 633 ton unit. It was manufactured in 1964. The 633 ton chiller is served by a cooling tower located west of the Plaza in a pit near the tunnel. The tower was manufactured in 1991 and has only run for about one week.

c. Chilled water is piped from the State Office Building through the tunnel to the Capitol. The pipes were installed in about 1992. The chilled water supply and return pipes are 8".

CURRRENT CAPITOL HVAC



ROTUNDA HVAC

d. The main HVAC system in the Capitol is a variable air volume (VAV) system with hot water reheat coils. Four large supply air fans (80,000 CFM each) are located in the Attic space around the dome. Each supply fan has a cooling/heating coil, filters, outside air/return air mixing dampers, outside air louver and relief air louver. The outside air intake louvers and the relief air louvers are located above the main roof level at each of the four fan room locations. The HVAC system was installed in the 1960's. It was originally constant volume but has been converted to variable volume. Supply air is ducted horizontally in the Attic space to the original perimeter shafts and some interior shafts. The shafts distribute the air down to all levels except for the Basement Floor. The supply air from the shafts is distributed horizontally in each room on each floor through ceiling supply air plenums. Hot water reheat coils in the ceiling space provide individual zone control. The supply air is then distributed through diffusers.

e. Return air from the perimeter rooms passes through wall grilles into the Rotunda. The return air travels up through the Rotunda space into four large return air grilles located at the ceiling of the top floor. There is no supply air directly provided into the Rotunda. The Rotunda is indirectly cooled by return air from the perimeter rooms.

f. Heating hot water is produced in two steam-to-hot water converters located in the Basement. Hot water is piped throughout the building to the air handlers and reheat coils. Hot water cabinet unit heaters are located at the major entries.

g. There are several small air handlers located in the Basement that serve the Basement area. Supply and return air is ducted from the air handlers, throughout the Basement.

1. HEATING, VENTILATING, COOLING & PLUMBING SYSTEMS

The standards, criteria and objectives for the restored building are:

* Life Safety
* Function - Efficient/ Effectiveness
* Historic / Architectural Integrity

a. Life Safety

1) STANDARD: Life safety is essential. The restored building must be safer than the present building. Ideally the mechanical systems for the restored Capitol would be as safe as a new building.

a) Objective: Compliance to applicable building codes and standards is required. Refer also to the "Life Safety Evaluation" section of the report.

b) Objective: Compliance to the OSHA (Occupational Safety and Health Administration) Regulations will be required.

b. Function - Efficiency/Effectiveness.

1) STANDARD: The building must be efficient in operation and maintenance.

a) Objective: A comfortable environment must be provided.

b) Objective: The mechanical system will be energy efficient.

c) Objective: The mechanical system must be easy to maintain. Equipment will be accessible.

d) Objective: Good engineering practice must be followed.

e) Objective: Initial construction costs and constructability will be considered.

c. Historic / Architectural Integrity

1) STANDARD: The historic integrity of the Capitol must be preserved.

a) Objective: The mechanical system must fit within the historical nature of the building and the site.

1. Information used in this analysis was obtain from several sources. Available drawings of the original building and subsequent alterations were reviewed. Visits were made to the building to field-determine current systems and equipment. History of maintenance and operating issues were obtained from building operations and maintenance personnel and from DFCM Architects and Engineers.

2. The current ceiling supply air plenums necessitate a dropped ceiling. This has aesthetic consequences in that the historic cornices are concealed and the ceiling level is lowered. In the restored building, the mechanical system needs to fit within the historical parameters of the building. The original shafts should be employed where possible. Attic space could be used to house equipment and ducts. A portion of the basement could also be used to house equipment and ducts.

3. Supply and return air terminals (diffusers, grilles, openings, etc.) in the restored capitol will need to be compatible with the historical nature of the building. Diffusers and grilles shall be concealed where possible. Where diffusers and grilles need to be exposed, they will be a historical style (i.e. cast brass, cast iron, custom design, custom built).

4. The Rotunda area is currently used as a return air plenum. The Rotunda would be classified as an Atrium under current codes. The Rotunda is the means of egress from many areas of the building. One of the issues in using the Rotunda as a return air plenum is that fire or smoke in a perimeter office could spread through the transfer grilles into the Rotunda. There are currently fire dampers in the transfer grilles. However, current codes do not allow Corridors to be used as return air plenums, even if combination fire/smoke dampers are installed.

5. Another issue is that the Rotunda is not directly cooled. It is indirectly cooled with return air. To date, this apparently has not been a major comfort problem. The mass of the building and the height of the dome help to mitigate the comfort problem through thermal mass and natural convection within the Rotunda. The thermal mass creates a "flywheel" effect. The warm air rises into the upper unoccupied space of the dome. However, as the building is used more in the future, lack of cooling will become more of an issue.

ROTUNDA COOLING AND VENTILATION

6. The Rotunda is also not directly ventilated with supply air. Current codes require the Rotunda to be provided with ventilation air. Inadequate ventilation leads to indoor air quality problems. Proper indoor air quality is essential.

7. The four main air handling units located in the attic space surrounding the dome do not have good access. Access to the fan level floor is via a stairway to one air handler and then via a catwalk to the other three air handlers.

8. The building HVAC system is 30 to 40 years old and has reached the end of its useful life. Heating and cooling coils erode. Supply air plenums develop leaks. Steam-to-water

converters erode and corrode or scale-up. Pump motors and impellers wear out. Fan motors wear out. Dampers wear out.

AGING EQUIPMENT

9. The central heating plant is housed in a building that is as old as the Capitol. The boilers, deaerators, pumps and controls are about 36 years old and are near the end of their average useful life. Boiler tubes and shell erode over time. The old boilers are not as efficient as new boilers. The old boilers are 70% to 75% efficient. New boilers are about 80% efficient.

CHILLERS

10. The 633 ton chiller located in the Basement is 36 years old and has reached the end of its average useful life. It also uses R-11 refrigerant which has been banned and is no longer being manufactured since it contains chlorofluorocarbons (CFC's). The two 350 ton chillers located in the Basement of the State Office Building also use R-11 refrigerant. None of the chillers are installed in an approved "Machinery Room" as required by current codes for safety reasons. The only standby cooling source is the 36 year old chiller.

ROTUNDA SMOKE EXHAUST

11. There is not an Atrium smoke exhaust system in the Rotunda. Current codes require one. The purpose of an Atrium smoke exhaust system is to keep the occupied area of the Atrium clear of smoke to allow for egress. If a fire occurred in the Rotunda, smoke would travel to the top of the Rotunda and start to fill the top part of the building with smoke. As the fire progressed, the smoke level would drop. The purpose of a smoke exhaust system is to prevent the smoke level from dropping down to the means of egress which is the balcony on the top floor. The rate of smoke exhaust must be equal to the rate of smoke produced in the fire. A "Rational Fire Modeling/Analysis" has been done to determine the capacity of the smoke exhaust system. The rational fire modeling/analysis uses computer simulation to model the fire. Under the currently adopted (1997) UBC and the 2000 UBC, the atrium smoke exhaust flows can be determined by the prescriptive method of the code or by a computer model of the fire using the actual building combustible material load, volume, geometry, etc. Refer also to the "Performance Based Design Approach" section in the "Life Safety" section of this report. Normally, the computer simulation results in less required air flow. However, the results are reversed for the Capitol. The large Christmas tree, along with the wooden platform and bleachers used during the Governors inauguration create a substantial combustible load. The required smoke exhaust flow could be reduced by eliminating some of the combustible materials. For instance, use metal platforms and bleachers instead of wood and/or eliminate the Christmas tree. However, the future use of the Rotunda should be considered. The Rotunda is being used more for private and diverse functions. The smoke exhaust system should be adequate to handle future temporary combustible loads. The results are as follows:

a. The prescriptive method of the code requires about 187,000 cubic feet per minute.
b. The computer simulation requires about 244,000 cubic feet per minute.

12. Rotunda Smoke Analysis:

ROTUNDA COMBUSTIBLE MATERIALS- TEMPORARY

The temporary combustible materials in the Rotunda (Atrium) are as follows:

a. Spruce Christmas tree, 36'-0" high, approximately 18" diameter trunk. Tree is sprayed with flame retardant.
b. (16) 8' - 0" long tables with pressed wood or plastic tops; half are wood, half are plastic.
c. (20) 6' - 0" long tables with pressed wood or plastic tops; half are wood, half are plastic.
d. (350) metal chairs, a portion of them are upholstered.
e. Coat racks.
f. Band stand risers; (4) sections each at 4' - 0" X 8' - 0", wooden.
a. Podium - Wood.
b. Piano.
c. Flags.
d. Trash barrels.
e. Stage/Bleachers - 30' - 0" long X 30' - 0" wide X 4' - 6" high; wood.
f. Platforms (6) 4' - 0" long X 4' - 0" wide X 1' - 0" high; wood.
g. Movie screen.
h. Curtain - 30' - 0" wide X 15' - 0" high.

ROTUNDA FURNITURE & FINISHES- PERMANENT

The permanent furniture and finishes in the Rotunda area are as follows:

a. Floors - Terrazzo and marble.
b. Doors - Metal.
c. Lower Walls - Marble.
d. Upper Walls - Plaster.
e. Murals in upper Rotunda - Canvas over wood.
f. (3) Wooden benches.
g. (1) Wooden information booth, approximately 4' - 0" X 4' - 0" X 8' -0" high.
h. Stair rails - Metal.
i. Ceiling (skylight) - Wired glass with metal frame.
j. Cornice - Plaster.
k. Window frames in upper Rotunda - Wood.
l. Display cabinets on Ground Floor - Wood frames with glass windows.

OSHA REQUIREMENTS

13. Compliance to OSHA Standards will be required. The OSHA Standards are an "operating" standard for the purpose of protecting the workers (State employees) within the building. The OSHA Standards are different from Building Codes in that "grandfathering" of original building codes is not considered in the OSHA Regulations. Under the building codes, if the occupancy does not change, the building does not need to be improved as new codes are adopted. Under the OSHA Regulations, the building must comply with the current OSHA Regulations whether the building occupancy has changed or not. The OSHA Regulations 1910.36 (b)(2) states: "Every building or structure shall be so constructed, arranged, equipped, maintained, and operated as to avoid undue danger to the lives and safety of its occupants from fire, smoke, fumes, or resulting panic during the period of time reasonably necessary for escape from the building or

ROTUNDA SHALL NOT BE A RETURN AIR PLENUM

structure in case of fire or other emergency." Section 1910.36 (b)(1) states: "The design of exits...will not depend solely on any single safeguard; additional safeguards shall be provided for life safety in case any single safeguard is ineffective due to some human or mechanical failure." Hence, the current air system using the Rotunda as a return air plenum may comply with building codes, but it does not comply with OSHA Regulations. Even if combination fire/smoke dampers are provided in the Office/Rotunda separation walls, it violates OSHA Regulations because the fire/smoke damper is a "single safeguard" that could fail due to a "human or mechanical failure." Obviously, this OSHA requirement is not currently enforced at the Capitol and is apparently not enforced in other buildings as well. Of course, other courses of action could mitigate the need for smoke exhaust, such as adding stairways and exits.

PLUMBING

14. The plumbing fixtures and piping systems have exceeded their average useful life and should be replaced. The fixtures are discolored and stained. Piping erodes, corrodes and scales-up over time.

OVERFLOW ROOF DRAINAGE

15. There is not an overflow roof drainage system. An overflow system is required by current codes. Overflow roof drainage systems protect the roof from collapsing if the primary roof drainage system fails.

REPLACE HVAC SYSTEM

1. Replace the entire building HVAC system. Provide new air handlers, fan coil units, pumps, steam-to-water converters, automatic temperature controls, hot water piping systems, and chilled water piping systems. Remove the ceiling supply air plenums. The advantages to this alternative are as follows: (a) The renovated Capitol would have a new HVAC system rather than an old system. (b) The new system would fit within the renovated historic nature of the building. (3) The new system would be state-of-the-art. (d) The new system would have better access for maintenance. (e) The new HVAC system would be more efficient than the existing system.

2. Keep the existing air handlers, pumps, steam-to-water converters, hot water piping system and chilled water piping system. The advantage to this alternative is initial cost savings.

3. Several different types of mechanical systems could be applied to the Capitol building. The overriding challenge will be fitting within the historical parameters of the building. The use of an "all-water" fan coil system would eliminate the need for dropped ceiling and supply air ductwork. The use of the original perimeter shafts located at each side of the columns will need to be maintained. Additional shafts may be required for return air. Refer to the drawings.

ROTUNDA HVAC

4. Supply air should be provided to the Rotunda area for the following reasons: (1) It will provide a source of make-up air for the atrium smoke removal system. (2) It will provide direct cooling and this improves comfort. (3) It will provide ventilation air for compliance with current codes and standards. New interior shafts will need to be provided for the supply and return air in the Rotunda area. Supply air should be distributed at each level. Relief air could be collected at the top floor and pulled through the combination relief air/smoke exhaust fans located in the attic. Refer to the drawings.

ALTERNATIVE HVAC SYSTEMS

5. HVAC systems include the following alternatives: (a) An "all-air" system, (b) An "all-water" system (fan coil units), (c) Combination of "all-air" and "all-water" systems. All-air systems could be variable air volume (VAV) systems with hot water reheat coils. VAV terminal boxes could be standard type or fan powered type. In areas with sidewall diffusers (which may include all perimeter rooms) fan powered VAV boxes should be used to maintain a constant throw distance at the diffuser to prevent "dumping" cool air on the occupants. All-water systems would be four-pipe (hot water supply, hot water return, chilled water supply, chilled water return) fan coil units. A VAV box or fan coil unit will be provided for each zone for individual temperature control. Refer to the drawings.

ALL-AIR SYSTEMS

a.. The all-air system has the following advantages:

1) Allows for central location of major equipment (air handlers) for ease of access and maintenance without interfering in occupied spaces.
2) Occupied spaces will be quieter, since noisy, vibrating equipment is remotely located.

3) Allows use of outside air economizer cooling in winter operation.
4) Will provide make-up air to the Atrium smoke exhaust system.
5) Allows use of single or two stage evaporative cooling.

The all-air system has the following disadvantages:

1) Requires space for ducts. This has serious implications since the original building design does not accommodate horizontal ductwork. Typically, about 10" of ceiling space is required for ducting in the perimeter rooms. More space will also be required for the vertical ducts located at the perimeter spaces. The all-air system requires 5-10 times as much air flow as the all-water/fan coil system (minimum outside ventilation air).
2) The fan powered VAV boxes have filters and motors that require regular maintenance.

ALL WATER SYSTEMS

b. The all-water (fan coil) system has the following advantages:

1) Requires less building space since the heating and cooling is delivered in pipes rather than ducts.
2) A smaller central air handler room.
3) Fan coil units are compact and may fit better in the historical parameter of the building, because they do not require supply and return air ductwork.

The disadvantages of a fan coil unit system are as follows:

1) Additional routine maintenance is required since each room has fan coil unit with filter, fan motor, control valves, coil, etc.
2) Maintenance must be done in the occupied areas. This may necessitate maintenance being done at night to avoid interrupting occupants.
3) Condensate pans and drains are required at each fan coil unit which require periodic cleaning.
4) A separate ventilation air system will be required with tempered outside air ducted to each room or fan coil unit.

AIR HANDLERS

c. With an all-air system, central air handlers could be located in the Basement, on the roof in penthouses, or in the Basement and on the roof. The advantages of locating the air handlers on the roof and in the Basement are:

1) Horizontal distribution ducts are smaller.
2) The need for vertical shaft space is reduced by 50% since air is being fed from the top and the bottom of the building.

The disadvantages of air handlers in the basement and on the roof are:

1) Duplication of automatic temperature controls.
2) Increased maintenance.

The disadvantage of locating the air handlers only on the roof is that the air handlers would be large and difficult to conceal.

d. An all-water system for the entire building has the stated advantage of decreased duct and central equipment space, but it has the following disadvantages:

1) The large volume of the Rotunda would be better handled with central air handlers.
2) This system will not provide an adequate source of make-up air for the Atrium smoke exhaust system.
3) A water-side economizer system would need to be incorporated for winter cooling. A water-side economizer system has a higher installed cost and a higher operating cost than an outside air economizer system.

COMBINATION ALL-AIR, ALL-WATER

e. A combination of all-air and all-water systems is an option. An all-air system for the Rotunda and an all-water system for the perimeter rooms has several advantages. It limits the horizontal and vertical duct space, it provides make-up air for the Atrium smoke exhaust system and it properly serves the Rotunda area with direct cooling and direct ventilation.

ATRIUM SMOKE EXHAUST

f. Provide an Atrium smoke exhaust system. Exhaust fans could be located in the Attic space where the four main supply air fans are currently located. Makeup air could be provided from the new building supply air system. Preheat coils would keep supply air above freezing when the air handlers were providing 100% outside air. Smoke exhaust fans could also be used for building relief air fans. Variable frequency drives should be provided on the fans. The fans would be on emergency power. Provide proper access to the fans.

1) Size the smoke exhaust fans for the current combustible load as defined. The air flow would be 244,000 CFM.
2) Size the smoke exhaust fans smaller by reducing the combustible load. Use metal bleachers instead of wood bleachers. Use metal platform instead of wood platform. Eliminate the Christmas tree. The required air flow could be reduced by 50% or more.

NEW HEAT PLANT

g. Provide a new central heating plant. Provide a new building. Replace the boilers, deaerators, pumps, controls, fuel tank, etc. Provide redundant capacity of "n+l" such that if one boiler fails, there will be sufficient capacity to handle the load. Provide a small boiler for summer use. Provide stack economizers for make-up air heating and feed water heating. The new central heat plant would have capacity for the possible expansion. The primary advantage of a new central heat plant is improved reliability. A new heating plant would also be 10% to 20% more efficient due to more efficient boilers, variable speed pumping and stack economizers.

h. Keep the existing boiler plant as is. Replace the boilers, deaerators, etc. as they fail. The advantage to this alternative is lower initial costs.

NEW COOLING PLANT

i. Provide a new central cooling plant. Demolish the 633 ton 36 year old chiller. Relocate or replace the two 350 ton chillers. Relocate or replace the two cooling towers. Provide redundant capacity of "n+l" such that if one chiller fails, there will be sufficient capacity to handle the load. Provide a constant flow primary chilled water loop and a variable flow secondary chilled water loop. Provide variable frequency drives on the secondary loop chilled water pumps. If the existing cooling towers are relocated, design the plant to accommodate the future conversion to ceramic fill cooling towers. Provide an indoor sump for winter operation. Provide a water side economizer system if fan coil systems are used. Consider a water-side economizer system for spring and fall cooling. The main advantage of a new central cooling plant is improved reliability, The energy efficiency would also improve from 5% to 15% due to more efficient chillers sand cooling towers. Also, the new chiller refrigerant would not contain CFC's.

j. Keep the existing chillers and cooling towers as is. Replace them as they fail. The advantage to this is lower initial costs.

TUNNEL

k. The tunnel from the Capitol to the Central Heat Plant is in good condition and could remain. The tunnel houses high pressure steam piping, condensate piping and chilled water piping. The piping in the tunnel is apparently in good condition and could be reused. A new tunnel would have to be extended to the new Central Heating and Cooling Plant.

l. The existing heating and cooling plants will have to remain operational during construction of the new heating and cooling plant.

REPLACE PLUMBING SYSTEM

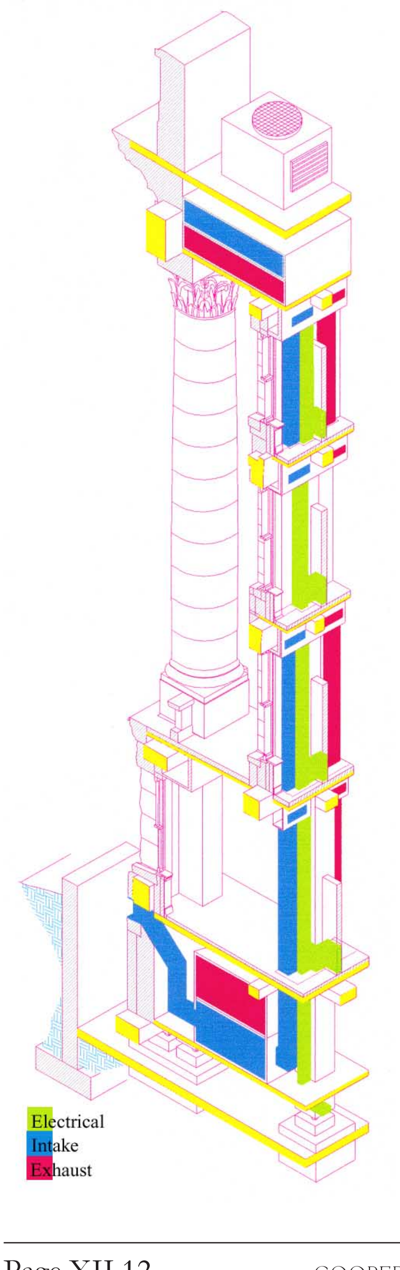
m. Replace the entire plumbing system, including fixtures, hot and cold water piping, waste piping, vent piping, roof drains, and roof drain piping.

n. Provide a new overflow roof drainage system.

o. The number of existing plumbing fixtures meets the requirements of the 1997 Uniform Building Code.

1. Replace the entire building HVAC system. Provide new air handlers, fan coil units, pumps, steam-to-water converters, automatic temperature controls, hot water piping systems, and chilled water piping systems. Remove the ceiling supply air plenums. Provide a return air path that complies with the OSHA Regulations.

2. An all-air system for the Rotunda area and an all-water system for the perimeter rooms is the recommended alternative. It limits the horizontal and vertical duct space, it provides make-up air for the Atrium smoke exhaust system and it properly serves the Rotunda area. The all-water/fan coil system for the perimeter rooms is not ideal, but is the best solution. Maintenance of the fan coil units will likely need to be done during unoccupied hours. The noise level will be higher, but not objectionable. Fan coil systems have been used successfully in some of the State Capitols that were toured. The all-water/fan coil system requires less horizontal and vertical duct space, which is limited. It will be very difficult to provide individual thermal zones for each office using the all-air system due to the limited vertical duct space available. (See drawings.) Provide (4) make-up air units for the fan coil units on the roof and (4) units in the Basement. Locate the Rotunda air handler in the Basement.



3. Provide an Atrium smoke exhaust system. Locate exhaust fans in the Attic space where the four main supply air fans are currently located. Provide make-up air from the new Rotunda supply air system and the fan coil unit make-up air system.

4. Provide a new central heating and cooling plant. Provide a new building. Replace the boilers, deaerators, pumps, controls, fuel tank, etc. Provide redundant capacity of "n+1" such that if one boiler fails, there will be sufficient capacity to handle the load. Provide a small boiler for summer use. Provide stack economizers for make-up air heating and feedwater heating. The new central heat plant would have capacity for the possible expansion.

5. Demolish the 633 ton 36 year old chiller. Provide new chillers and new cooling towers. Provide redundant capacity of "n+1" such that if one chiller fails, there will be sufficient capacity to handle the load. Provide a constant flow primary chilled water loop and a variable flow secondary chilled water loop. Provide variable frequency drives on the secondary loop chilled water pumps. Provide an indoor sump for winter operation. Provide a water side economizer system for fan coil system.

6. Extend new tunnel to the new Central Heating and Cooling Plant.

7. The existing heating and cooling plants will have to remain operational during construction of the new heating and cooling plant.

8. Replace the entire plumbing system, including fixtures, hot and cold water piping, waste piping, vent piping, roof drains, and roof drain piping.

9. Provide a new overflow roof drainage system.

SUMMARY OF RECOMMENDED ALTERNATIVE COSTS

1. The new Mechanical System in Capitol Building Renovation cost will be approximately $45.00 per square foot of floor space. This includes HVAC, plumbing and fire sprinkling.

   297,777 sq. ft. x $45.00/sq. ft. = $13,399,965.00

2. New Central Heating and Cooling Plant Mechanical System. This includes capacity for the future office building.

Equipment	Unit Cost	Cost
(3) 500 HP Steam Boilers	$150,000.00	$450,000
(1) 100 HP Steam Boiler	51,000.00	51,000
(1) Deaerator	45,000.00	45,000
Steam Piping and Valves		30,000
(3) 500 Ton Chillers	209,000.00	627,000
(3) 500 Ton Cooling Towers	100,000.00	300,000
(6) Chilled Water Pumps	4,000.00	24,000
Chilled Water Piping and Valves		32,000
(6) Condenser Water Pumps	4,800.00	28,800
Condenser Water Piping and Valves		40,000
Tunnel includes Piping		150,000
Automatic Temperature Controls		40,000
Test and Balance		20,000
System Commissioning		50,000
SUB TOTAL		1,887,800
Miscellaneous Costs 25%		471,950
TOTAL		2,359,750

SUMMARY OF MECHANICAL COSTS

Estimated Capitol Renovation =	$13,399,965.00
Estimated Central Plant =	$ 2,359,750.00
TOTAL ESTIMATED MECHANICAL COSTS =	$15,759,715.00

~~Examples of historically sensitive responses to modern mechanical upgrades from the Texas Capitol renovation in~~ Austin. These particular solutions are not being suggested as much as indicating that solutions specific to each problem are available.

TEXAS CAPITOL: WOOD PANEL-LING AND MIRRORS CONCEAL HVAC SYSTEM

CLOSE UP OF DUCT

TEXAS CAPITOL: WOODEN PARTITION CONCEALS

TEXAS CAPITOL: SCREENS IN COFFERS ALLOW VENTILATION BETWEEN HVAC SYSTEMS IN CEILING AND LARGE ROOM SPACE

TEXAS CAPITOL: HISTORIC VENTS WERE BUILT INTO COFFERED SYSTEM